CLAIMS

1. A lithographic projection apparatus comprising:

a radiation system configured to provide a beam of radiation;

a support structure configured to hold a patterning device, the patterning device configured to pattern the beam according to a desired pattern;

a substrate table configured to hold a substrate;

a projection system configured to project the beam as patterned onto a target portion of the substrate;

an object;

an electrode in vicinity of the object; and

a voltage synchronizer configured to provide a time varying voltage difference between the object and the electrode in synchronism with a pulse of the beam, the time varying voltage imparting a repetitive negative potential to the object relative to the electrode to transport secondary electrons formed during irradiation away from the object.

2. The lithographic projection apparatus according to claim 1, wherein the object is in a path of the beam.

3. The lithographic projection apparatus according to claim 1, wherein the time varying voltage imparts the negative potential to the object relative to the electrode for a time period sufficient to transport substantially all secondary electrons formed during irradiation away from the object.

4. The lithographic projection apparatus according to claim 1, wherein the negative potential is provided for a time of between 0.01 microseconds and 10 microseconds.

5. The lithographic projection apparatus according to claim 1, wherein the negative potential is provided for 0.1 microsecond.

6. The lithographic projection apparatus according to claim 1, wherein the negative potential is between 0 V and -1000 V.

7. The lithographic projection apparatus according to claim 1, wherein the negative potential is between 0 V and -100 V.

8. The lithographic projection apparatus according to claim 1, wherein the voltage synchronizer is connected to the object and configured to provide the voltage difference between the object and the electrode.

9. The lithographic projection apparatus according to claim 1, wherein the voltage synchronizer is connected to the electrode and configured to provide the voltage difference between the object and the electrode.

10. The lithographic projection apparatus according to claim 1, wherein the negative potential is applied in phase with a high state of the pulse of the beam.

11. The lithographic projection apparatus according to claim 1, wherein a phase difference between application of the negative potential and a high state of the pulse of the beam is arbitrary.

12. The lithographic projection apparatus according to claim 1, wherein the negative potential is succeeded by an associated positive potential.

13. The lithographic projection apparatus according to claim 12, wherein the positive voltage is between 0 V and +1000 V.

14. The lithographic projection apparatus according to claim 12, wherein the positive voltage is between 0 V and +100 V.

15. The lithographic projection apparatus according to claim 1, further comprising a radiation source configured to provide the beam in a pulsed manner between a high state and a low state.

16. The lithographic projection apparatus according to claim 1, wherein the time varying voltage has the form of a square wave.

17. The lithographic projection apparatus according to claim 1, wherein the time varying voltage has the form of a sinusoidal wave.

18. The lithographic projection apparatus according to claim 1, comprising a measuring device configured to measure current generated by secondary electrons in the electrode.

19. A method of manufacturing a device by a lithographic process, comprising:

providing a beam of radiation;

projecting the beam as patterned onto a target portion of a substrate; and

providing a time varying voltage in synchronism with a pulse of the beam to at least one of an object and an electrode in vicinity of the object, the time varying voltage imparting a repetitive negative potential to the object relative to the electrode to transport secondary electrons formed during irradiation away from the object.

20. The method according to claim 19, wherein the object is in a path of the beam.

21. The method according to claim 19, comprising measuring the amount of secondary electrons incident on the electrode.

22. The method according to claim 19, wherein the negative potential is succeeded by providing an associated positive potential.

23. A lithographic projection apparatus comprising:

a radiation system configured to provide a beam of radiation;

a support structure configured to hold a patterning device, the patterning device configured to pattern the beam according to a desired pattern;

a substrate table configured to hold a substrate;

a projection system configured to project the beam as patterned onto a target portion of the substrate;

an object in a path of the beam;

an electrode in vicinity of the object; and

a synchronized voltage source configured to provide a time varying voltage difference between the object and the electrode in synchronism with a pulse of the beam, the time varying voltage imparting a repetitive negative potential to the object relative to the electrode to transport secondary electrons formed during irradiation away from the object.

24. The lithographic projection apparatus according to claim 23, wherein the negative potential is succeeded by an associated positive potential.